Recommended Maintenance Schedule

Maintenance Service Interval	Maintenance Procedure
After the first 8 hrs	• Change hydraulic filter
Daily	• Grease the traction unit • Check engine oil level • Check for loose fasteners • Clean/inspect the tracks for damage or wear • Check the cooling system • Drain water and other contaminants from the fuel filter/water separator • Clean the radiator • Remove debris from the traction unit
25 hrs	• Check hydraulic oil
After the first 50 hrs	• Change engine oil & filter • Check & adjust track tension
100 hrs	• Change engine oil • Check battery electrolyte level • Check battery cable connections • Check cooling system hoses • Check the alternator/fan belt tension (refer to engine operator's manual) • Check hydraulic lines for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather and chemical deterioration • Check & adjust track tension • Check for dirt build-up in the chassis

Maintenance Service Interval	Maintenance Procedure
200 hrs	• Change hydraulic filter • Replace primary air filter • Change engine oil filter
250 hrs	• Check & grease the road wheels
400 hrs	• Inspect fuel lines for leaks • Change hydraulic oil and filter • Change the hydraulic fluid
500 hrs	• Replace the alternator/fan belt (refer to the engine operator's manual)
600 hrs	• Replace the safety air filter
1,500 hrs	• Replace all moving hydraulic hoses
Yearly	• Change the engine coolant • Check the condition of the hydraulic pump belt
Yearly Storage	• Check for loose fasteners • Touch up chipped paint • Adjust track tension • Check tracks and road wheels • Complete all yearly maintenance procedures specified in the engine operator's manual • Charge the battery and disconnect the cables (storage only)
Every 2 Years	• Drain & clean the fuel tank

Important: Refer to your engine operator's manual for additional maintenance procedures.

Note: The hourmeter does not have service indicators.

Greasing the Traction Unit

Grease all pivot joints every 8 operating hours and immediately after every washing.

Grease Type: Lithium based NLGI2

1. Lower the loader arm and stop the engine. Remove the key from the ignition switch.
2. Clean the grease fittings with a rag.
3. Connect grease gun to each fitting and pump grease into the fittings until grease begins to ooze out (approximately 3 pumps).
4. Wipe any excess grease.

There are 12 grease fittings on the TX525:
(4) are located on the left side (Fig. 0001).

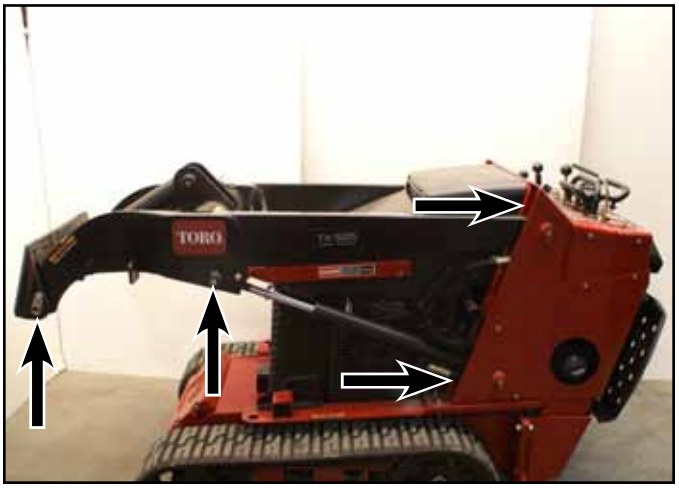

Fig 0001 PICT-8726a

(4) are located on the right side (Fig. 0002).

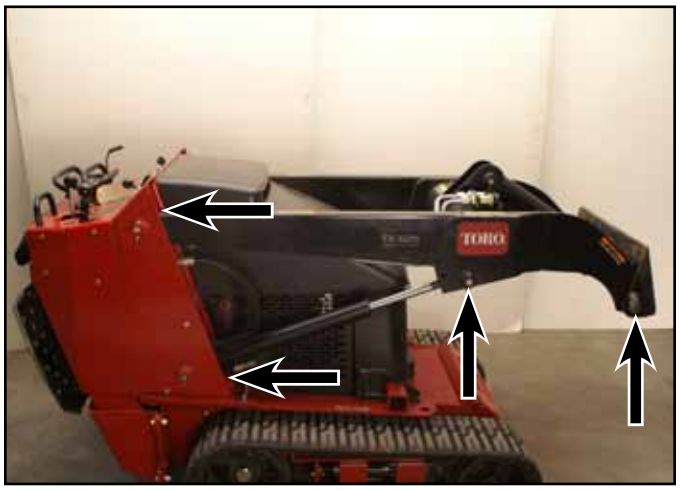

Fig 0002 PICT-8729a

(4) are located in the front on the quick attachment assembly and the front loader arm assembly (Fig. 0003).

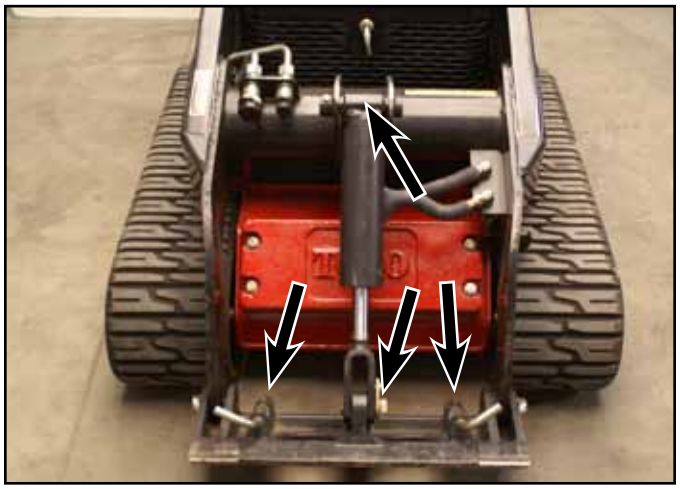

Fig 0003 PICT-8730

Maintaining the Road Wheels

1. If the inner wheels or the complete tray of wheels needs maintenance, remove the tracks. Refer to “Wide Track Removal” on page 7-68 or “Narrow Track Removal” on page 7-72.

2. Remove the snap ring from a road wheel (Fig. 0004).

Fig 0004 DSC-0821a

3. Remove the wheel bearing cap with seal (Fig. 0005).

Fig 0005 DSC-0822

4. Ensure that the road wheel turns smoothly on the bearing. If it does not turn smoothly or spin freely, replace the bearing; refer to “Road Wheel Rebuild” on page 7-79.

5. Check the grease under the cap and around the gasket. If it is dirty, gritty, or depleted, clean out all of the grease, replace the gasket, and fill the head of the cap with new grease (Fig. 0006).

Note: It is not always necessary to remove the track guide when replacing any of the road wheel bearings. They can also be removed by raising the unit off the ground. For safety reasons, make sure the frame of the unit is supported.

Fig 0006 DSC-0835a

Hydraulic Reservoir Tank

Location

The hydraulic reservoir tank is located in the front of the TX525 unit.

Hydraulic Tank Capacity: 10.5 gallons (39.7 liters)

Type of Oil to Use: 10w-30 or 15w-40 detergent, diesel engine oil (API Service CH-4 or higher).

Checking the Hydraulic Fluid

Check the hydraulic fluid level daily before the engine is first started and after every 25 operating hours.

1. Remove the attachment, if one is installed.
2. Park the traction unit on a level surface, open the hood, raise the loader arm, install cylinder lock and fully retract the tilt cylinder.
3. Stop the engine, remove the key, and and allow the engine to cool.
4. Remove the LH side grill.
5. Clean the area around the filler neck of the hydraulic tank (Fig. 0007).

Fig 0007 PICT-8731

6. Remove the cap from the filler neck and check the fluid level on the dipstick (Fig. 0008).

Fig 0008 PICT-8738

7. The fluid level should be between the marks on the dipstick. If the level is low, add enough fluid to raise it to the proper level.
8. Install the cap on the filler neck.
9. Install the RH side grill.
10. Start the unit, remove the cylinder lock and lower the loader arms.
11. Close the hood.

Replacing the Hydraulic Filter

Change the hydraulic filter:

- After the first 8 operating hours.
- After every 200 operating hours.

1. Position the traction unit on a level surface.
2. Lower the loader arm, stop the engine, and remove the key.
3. Remove the rear access cover.

IMPORTANT: Do not substitute an automotive oil filter or severe hydraulic system damage may result.

4. Place absorbant towels under the filter.
5. Remove the old filter (Fig. 0009).

Fig 0009 Belt 013

6. Wipe the surface of the filter adapter gasket area clean.
7. Pre-fill the hydraulic oil filter with oil and apply a thin coat of oil to the rubber gasket on the replacement filter.
8. Install the replacement hydraulic filter onto the filter adapter. Hand tighten it clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 3/4 turn.
9. Remove absorbant towels and wipe up any spilled fluid.
10. Open the hood. Start the engine, raise and lower the loader arm.
11. Raise the loader arm and install cylinder lock.
12. Stop the engine, remove the LH side grill, check the fluid level in the hydraulic tank (refer to “Checking the Hydraulic Fluid” on page 3-4) and add fluid to raise the level to the mark on the dipstick. Do not over fill the tank.
13. Install LH side grill.
14. Install the rear access cover.
15. Remove cylinder lock and lower the loader arms.
16. Close the hood.

Note: Dispose of used oil and filters at a certified recycling center.

Changing the Hydraulic Fluid

Change the hydraulic fluid every 400 operating hours or yearly.

Note: The hydraulic filter should be replaced whenever the hydraulic oil is changed.

1. Position the traction unit on a level surface and open the hood.
2. Raise the loader arm, install the cylinder lock, stop the engine, and remove the key.
3. Allow the traction unit to cool completely.
4. Place a large drain pan (capable of holding 15 gallons) under the drain plug on the front of the traction unit (Fig. 0010).

Fig 0010 PICT-8725

5. Remove the LH side grill.
6. Clean the area around the filler neck of the hydraulic tank. Remove the hydraulic tank cap and dipstick (Fig. 0011 and Fig. 0012).

Fig 0011 PICT-8731

Fig 0012 PICT-8738

7. Remove the drain plug and allow the oil to drain into the pan.

8. When oil is finished draining, install and tighten the drain plug.

Note: Dispose of the used oil at a certified recycling center.

9. Fill the hydraulic tank with approximately 10.5 gallons (39.7 liters) of 10w-30 or 15w-40 detergent, diesel engine oil (API Service CH-4 or higher).

10. Replace the hydraulic filter. Refer to “Replacing the Hydraulic Filter” on page 3-5.

11. Start the engine, remove the cylinder lock, raise and lower the loader arm, then drive the unit forward and backward to purge air from the system and check for leaks.

12. Stop the engine.

13. Check the hydraulic fluid level and top it off if necessary.

14. Replace the hydraulic tank cap and dipstick (Fig. 0013).

Fig 0013 PICT-8731

15. Install LH side grill.

16. Remove cylinder lock and lower the loader arms.

17. Close the hood.

Checking the Hydraulic Lines

After every 100 operating hours, check the hydraulic lines and hoses for leaks, loose fittings, kinked lines, loose mounting supports, wear, and weather or chemical deterioration. Replace all moving hydraulic hoses every 1500 hours or 2 years, whichever comes first. Make necessary repairs before operating.

Vents - Hydraulic Tank

Note: When checking hydraulic lines and hoses, also check the hydraulic tank vent to make sure it is clean and free of debris (Fig. 0014).

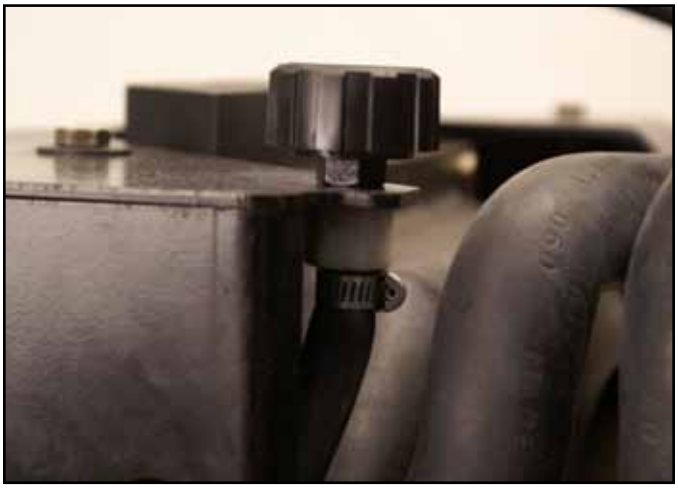

Fig 0014 PICT-8740

Engine Servicing

Oil Dipstick - check oil level daily (Fig. 0015).

Fig 0015 PICT-8741

Oil Drain (Fig. 0016 and Fig. 0017)

Fig 0016 PICT-8914

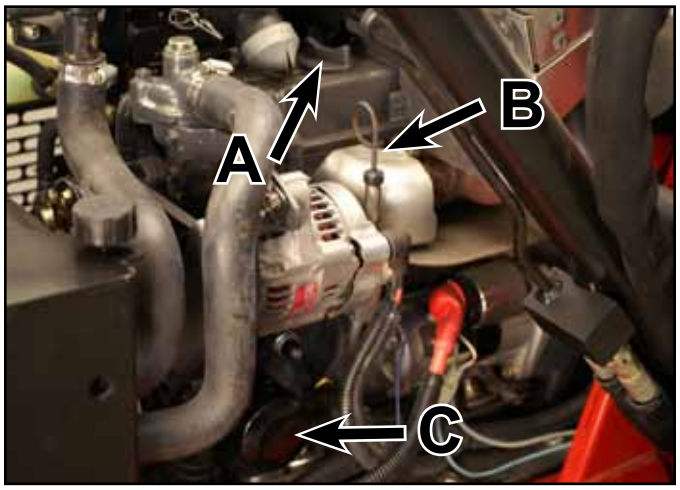

Fig 0017 PICT-8744

A. Oil fill
B. Oil dipstick
C. Oil filter

- Change oil after the first 50 hrs then every 100 hrs[1, 2]
- Oil Filter 200 hrs[1, 3]

[1]More often in dusty, dirty conditions.
[2]Change oil after the first 50 operating hours.
[3]For severe duty or rental applications, change every 100 operating hours.

Oil type: Detergent diesel engine oil (API Service CH-4 or higher)

Crankcase capacity: With filter 0.98 gallons (3.7 liters)

Servicing the Cooling System

Service Interval:

- Before each use or daily - Clean the radiator.
- Every 100 hours - Check the cooling system hoses.
- Yearly - Change the engine coolant.

Fig 0018 PICT-8749

If the engine has been running, the pressurized, hot coolant can escape and cause severe burns.

- Do not remove the radiator cap when the engine is hot. Always allow the engine to cool at least 15 minutes or until the radiator cap is cool enough to touch without burning your hand before removing the radiator cap.
- Do not touch radiator and surrounding parts that are hot.
- Use a rag when opening the radiator cap, and open the cap slowly to allow steam to escape.

Cleaning Radiator

The engine fan draws the air from the engine compartment and pushes the air through that hydraulic oil cooler and radiator. Remove any build up of debris on the oil cooler and radiator with compressed air.

Engine Coolant

If you need to add engine coolant, refer to “Checking, Adding & Bleeding the Engine Coolant” on page 4-138.

Change the engine coolant yearly. Refer to “Changing Engine Coolant” on page 3-10.

Changing Engine Coolant

1. Park the machine on a flat surface, open the hood and raise the loader arm. Lock the loader arm into position using the loader arm lock.
2. Turn the machine off and allow it to cool.
3. Remove the left and right hand side panels (Fig. 0019).

Fig 0019 PICT-4945

4. Remove the breather from the breather tube (Fig. 0020).

Fig 0020 PICT-4946a

5. Remove the 4 bolts securing the grill assembly to the frame (Fig. 0021).

Fig 0021 PICT-4953

6. Slide the grill assembly forward (Fig. 0022).

Fig 0022 PICT-4955

7. Remove the 2 bolts and nuts securing the overflow tank bracket to the grill assembly (Fig. 0023).

Fig 0023 PICT-4959

8. Remove the grill assembly taking care not to damage the hydraulic tank breather hose (Fig. 0024).

Fig 0024 PICT-4961

9. Inspect the foam seals on the inside of the grill assembly. Replace if worn or damaged (Fig. 0025).

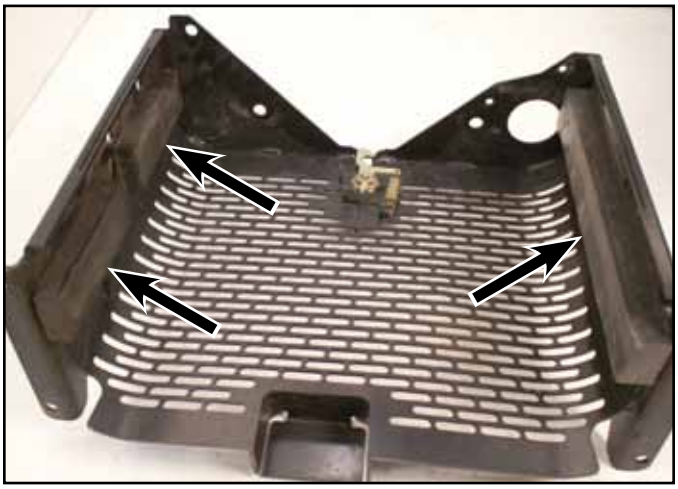

Fig 0025 PICT-5138a

10. Place an absorbent towel under the oil cooler inlet fitting located on the lower left hand corner of the oil cooler.

11. Using a 1-1/16” and a 1-1/8” wrench, remove the oil cooler inlet line from the oil cooler inlet fitting (Fig. 0026).

Fig 0026 PICT-4965

12. Cap the hydraulic line and fitting so debris does not enter the system.

13. Place an absorbent towel under the oil cooler outlet fitting located on the upper right hand corner of the oil cooler.

14. Using a 1-1/16” and a 1-1/8” wrench, remove the oil cooler outlet line from the oil cooler outlet fitting (Fig. 0027).

Fig 0027 PICT-4968a

15. Cap the hydraulic line and fitting so debris does not enter the system.

16. Using a 1/2” socket, remove the 3 bolts securing the radiator mount to the frame (Fig. 0028).

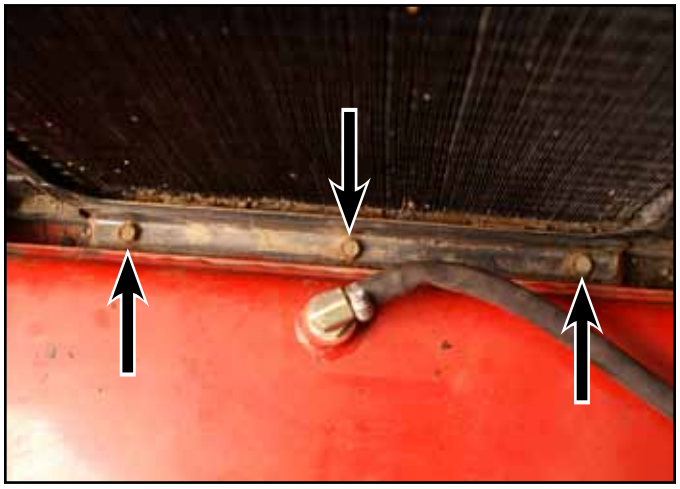

Fig 0028 PICT-4969

17. Remove the front radiator mount (Fig. 0029).

Fig 0029 PICT-4971

18. Tilt the radiator/oil cooler assembly forward and lift it out of the frame so that the petcock drain is above the frame (Fig. 0030).

Fig 0030 PICT-4973

19. Slide a length of 5/16” hose onto the petcock drain. Place the other end of the hose into a drain pan. Open the petcock and remove the radiator cap to drain the anti-freeze (Fig. 0031).

Fig 0031 PICT-4974

20. Remove the drain hose and close the petcock.

21. Using a 17mm wrench, remove the engine block coolant drain plug (Fig. 0032).

Fig 0032 PICT-8910

Changing Engine Coolant Assembly

1. Clean any debris around and under the radiator.

2. Using a 17mm wrench install the engine block coolant drain plug (Fig. 0033).

Fig 0033 PICT-8910

3. Remove the drain hose and close the petcock.

4. Position the radiator/oil cooler assembly into the frame so it is on top of the foam seals and behind the 3 radiator mount holes (Fig. 0034).

Fig 0034 PICT-5122

5. Using 1-1/16” and 1-1/8” wrenches, install the hydraulic outlet line to the oil cooler outlet fitting (Fig. 0035).

Fig 0035 PICT-5126

6. Position the radiator mount into the frame (Fig. 0036).

Fig 0036 PICT-5129

7. Loosely install 3 screws that will secure the radiator mount to the frame (Fig. 0037).

Fig 0037 PICT-5131

8. Center the radiator and oil cooler assembly side to side in the frame so there is approximately a 1/8” space between the fan shroud and the fan. Spin the cooling fan. Ensure the fan does not come into contact with the fan shroud. Adjust the radiator side to side as necessary (Fig. 0038).

Fig 0038 PICT-5135

9. Without moving the position of the radiator, slide the radiator mount against the radiator and tighten the 3 radiator mount screws (Fig. 0039).

Fig 0039 PICT-5137

10. Position the grill onto the frame and route the breather tube in between the foam seals on the inner left side of the grill (Fig. 0040).

Fig 0040 PICT-5139

11. Slide grill onto the frame so the grill base sits under the loader stops and the top of the grill sits on top of the radiator. Leave the grill in a slightly forward position. The overflow tank mounting holes should be just beyond the right hand boss on top of the radiator assembly. This will allow the overflow bottle assembly to be installed (Fig. 0041).

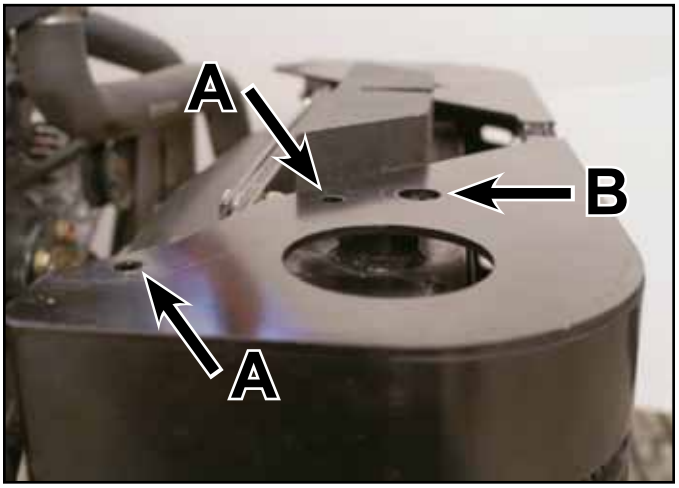

Fig 0041 PICT-5141a

A. Overflow tank mounting holes
B. Right hand boss

12. Position the overflow tank bracket onto the grill assembly (Fig. 0042).

Fig 0042 PICT-5143a

13. Install 2 bolts and nuts securing the overflow bottle assembly to the grill assembly (Fig. 0043).

Fig 0043 PICT-5145

14. Slide the grill assembly back aligning the mounting holes with the holes in the frame. Loosely install 4 bolts securing the grill assembly to the frame and the 2 bolts and washers securing the grill to the radiator (Fig. 0044).

Fig 0044 PICT-5146

15. Using a 1/2” socket, tighten the 4 bolts securing the grill assembly to the frame (Fig. 0045).

Fig 0045 PICT-5150

16. Check the cooling fan and shroud clearance. Adjust the position of the radiator if necessary.

17. Using a 9/16” socket, tighten the 2 bolts securing the radiator to the grill assembly (Fig. 0046 and Fig. 0047).

Old style (use bolts and washers):

Fig 0046 PICT-5604

New style (use flange head bolts):

Fig 0047 PICT-5605

18. Position the breather tube under the grill and install the breather (Fig. 0048).

Fig 0048 PICT-5157

19. Fill the radiator. Refer to “Checking, Adding & Bleeding the Engine Coolant” on page 4-138.

20. Clean the area around the filler neck of the hydraulic tank.

21. Remove the cap from the filler neck.

22. Fill the hydraulic tank with of 10W-30 or 15W-40 detergent, diesel engine oil (API service CH-4 or higher).

23. Start the engine and let it run for a few minutes.

24. Stop the engine.

25. Check the fluid level on the dipstick. The fluid level should be between the marks on the dipstick.

26. Install the cap into the hydraulic tank filler neck.

27. Install the left and right hand side panels (Fig. 0049).

Fig 0049 PICT-4945

28. Remove the cylinder lock and lower the loader arms.

29. Close the hood.

30. Purge air from the hydraulic system. Refer to “Purging Air Procedure” on page 9-19.

Fuel System

Drain the fuel filter/water separator before each use or daily (Fig. 0050).

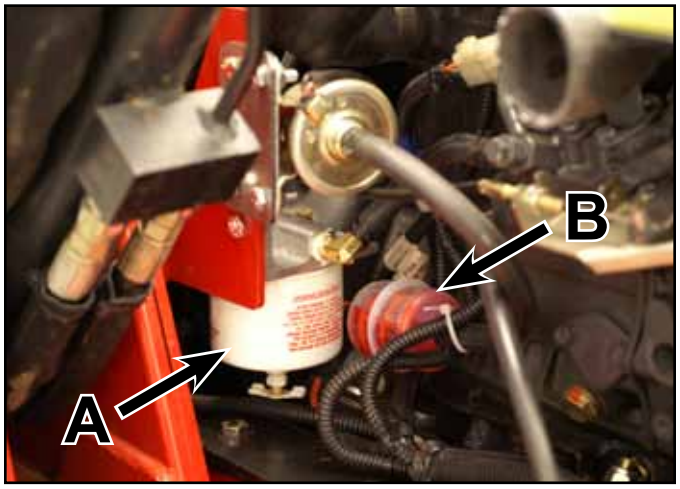

Fig 0050 PICT-8751

A. Fuel filter/water separator

B. In-line fuel filter

Drain & Clean Fuel Tank

Draining the fuel tank
Service interval: Every 2 years.

Replacing the fuel filter/water separator
Service interval: Every 400 hours

1. Clean the area where the fuel filter/water separator mounts.

2. Remove the fuel filter/water separator and clean the mounting surface.

3. Lubricate the gasket on the new fuel filter/water separator with clean oil.

4. Install the fuel filter/water separator by hand until the gasket contacts the mounting surface, then rotate it an additional 1/2 turn.

Fuel Tank Removal

1. Park the machine so that the tracks are resting on 2x4s.

2. Open the hood. Raise the loader arms, install the cylinder lock, stop the engine and remove the key.

3. Apply the parking brake.

3. Remove the rear access panel (Fig. 0051).

Fig 0051 PICT-4505a

4. Using a 3/8” socket, remove the 6 screws that secure the left and right rear cover support panels to the tower assembly (3 screws per panel). Remove the panels (Fig. 0052).

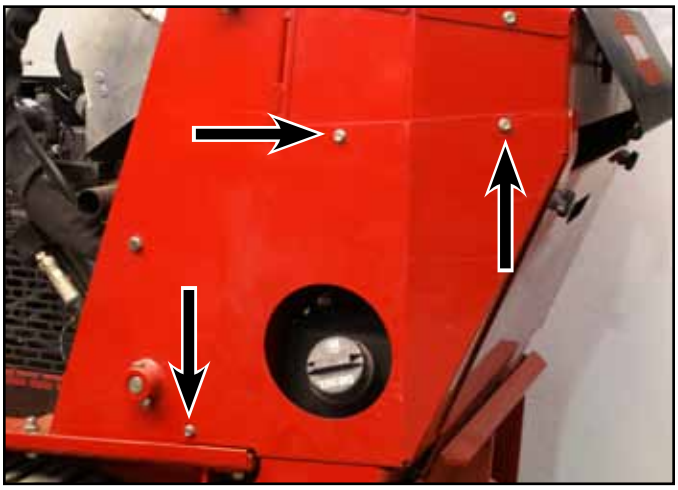

Fig 0052 PICT-8934

5. Using 3/4” and 1/2” sockets, remove the 7 bolts and nuts securing the rear frame cover to the frame and fuel tank bracket. Remove the rear frame cover (Fig. 0053).

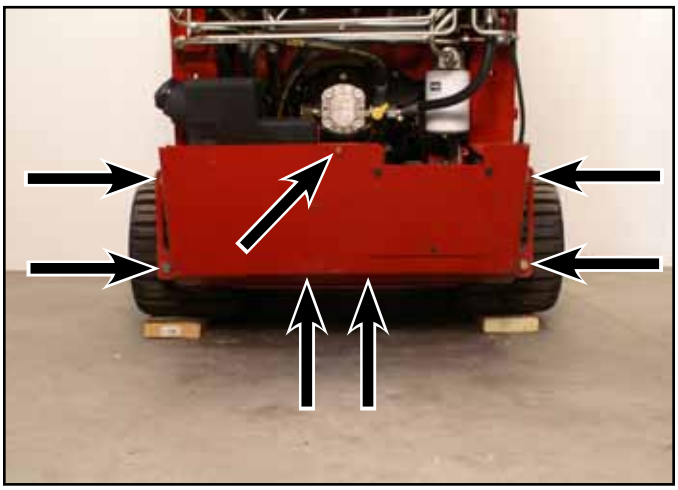

Fig 0053 PICT-5381

6. Remove the fuel tank bracket (Fig. 0054).

Fig 0054 PICT-5625

7. Disconnect the two wires (black and orange) from the fuel sending unit located on the top of the fuel tank (Fig. 0055).

Fig 0055 PICT-4262a

8. Mark the suction fuel line and tank fitting with an “S” and the return fuel line and tank fitting with an “R” (Fig. 0056):
   S - Fuel suction line
   R - Fuel return line

Fig 0056 PICT-4263

9. Slide the 2 fuel hose clamps down the fuel line away from the fuel tank fittings (Fig. 0057).

Fig 0057 PICT-4264

10. Slide the 2 fuel lines off the fuel tank fittings. Remove the fuel tank (Fig. 0058).

Fig 0058 PICT-4265

11. Remove the fuel cap and tip the fuel tank to dump any remaining fuel from the tank into a proper drain pan.

12. Add approximately 1/2 gallon (2 liters) clean fuel to the tank and install fuel cap and slosh the fuel in the tank remove the fuel cap and dump fuel into a proper drain pan. Repeat process until the fuel tank is clean. Replace the fuel tank if the fuel tank does not become clean.

Fuel Tank Installation

1. Slide the 2 fuel lines onto the fuel tank fittings. Install the fuel tank (Fig. 0059).

Fig 0059 PICT-4265

2. Slide the 2 fuel hose clamps up the fuel line to the fuel tank fittings (Fig. 0060).

Fig 0060 PICT-4264

3. Connect the two wires (black and orange) to the fuel sending unit located on the top of the fuel tank (Fig. 0061).

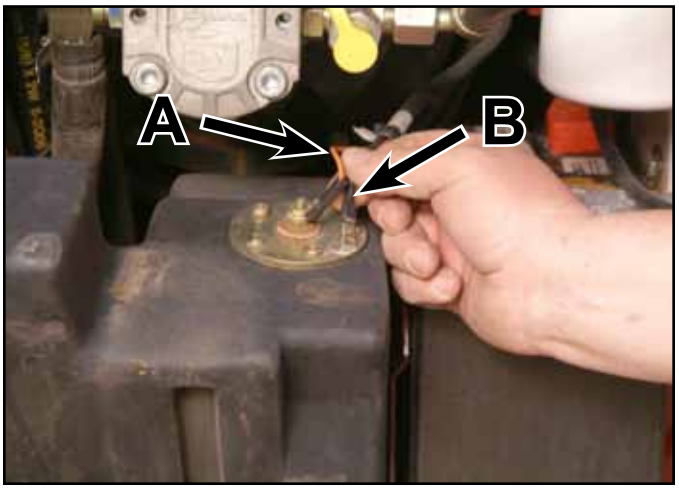

Fig 0061 PICT-4262a

A. Orange wire (center terminal)

B. Black wire (outside terminal)

4. Install the rear frame cover. Using 3/4” and 1/2” sockets, isntall the 7 bolts and nuts securing the rear frame cover to the frame and fuel tank bracket (Fig. 0062).

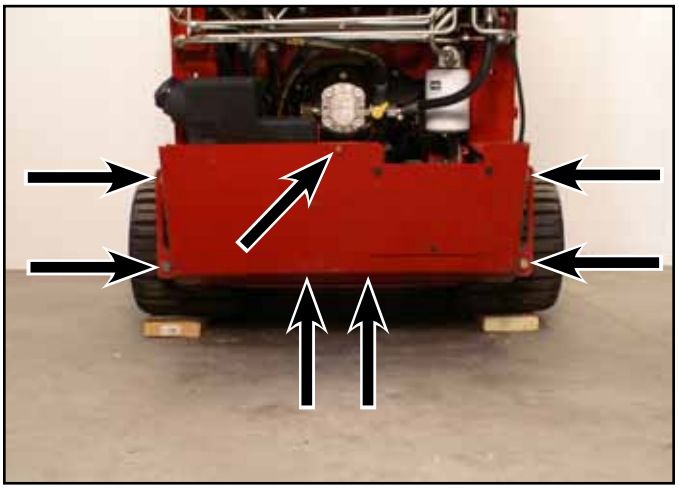

Fig 0062 PICT-5381

5. Install the fuel tank bracket nut and bolt (Fig. 0063).

Fig 0063 PICT-5625

6. Install the left and right rear cover support panels. Using a 3/8” socket, install the 6 screws that secure the left and right rear cover support panels to the tower assembly (3 screws per panel) (Fig. 0064).

Fig 0064 PICT-4256

7. Install the rear access panel (Fig. 0065).

Fig 0065 PICT-4505a

8. Remove the right hand side panel (Fig. 0066).

Fig 0066 PICT-4942

9. Change the fuel filter/water separator and the inline fuel filter (if applicable).
10. Install the right hand side panel.
11. Remove the loader lock and lower the loader arm.
12. Close the hood.
13. Add fuel to the tank and install cap.
14. Release the parking brake.
15. Drive the unit off the 2x4's.

Replacing the In-Line Fuel Filter (Serial numbers 280000500 & higher)

Replace the in-line filter when damage, contamination or debris is present.

1. Locate the in-line fuel filter (Fig. 0067) and note the direction of flow arrow on the side of the in-line filter.

Fig 0067 PICT-8751

2. Open the clamps on each end of the in-line filter and slide the hoses off of it. Discard the filter.

3. Slide the hoses over the end of a new filter, ensuring that the arrow on the filter is pointing in the same direction as the one on the old filter.

4. Secure the hoses with the hose clamps.

Air Filter

Service Interval:

- Every 200 hours - replace the primary air filter
- Every 600 hours - replace the secondary air filter

** More often in dusty, dirty conditions*

Fig 0068 PICT-8748

Fuse Block

To access the fuses, you must remove the heat shield.

1. Stop the engine and remove the key.
2. Raise the hood.
3. Pull the hairpin cotter from the bottom end of the hood prop rod and slide the prop rod out of the retaining brackets and the prop rod tab.
4. Remove the 4 screws securing the heat shield and then pull the shield out and up to remove it.
5. Check the fuses. Replace as necessary (Fig. 0069).

Note: Fuses can be removed to check continuity. The test meter should read less than 1 ohm.

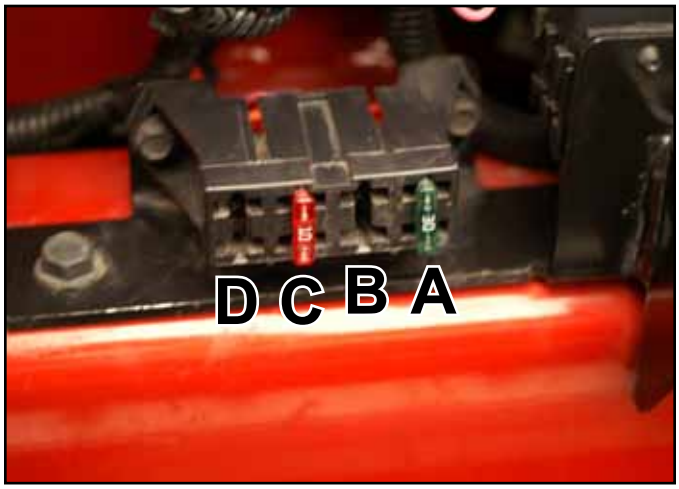

Fig 0069 PICT-8753

A. 30 amp = Main circuit
B. Empty
C. 10 amp = Control panel / Relay
D. Open position for optional accessories

6. Install the heat shield using the 4 screws removed previously.
7. Install the prop rod into the retaining brackets and prop rod tab and secure it with the hairpin cotter.
8. Close the hood.

Hydrostatic Pump Belt

Every 25 hours inspect the drive belt for wear or damage.

Replace the belt if you find any signs of wear, cracks, or damage or yearly, whichever comes first (Fig. 0070).

Fig 0070 PICT-8756

Alternator/Fan Belt

Fan Belt Tension: Deflects 0.28 to 0.35” (7 to 9mm) when the belt is pressed in the middle of the span (Fig. 0071).

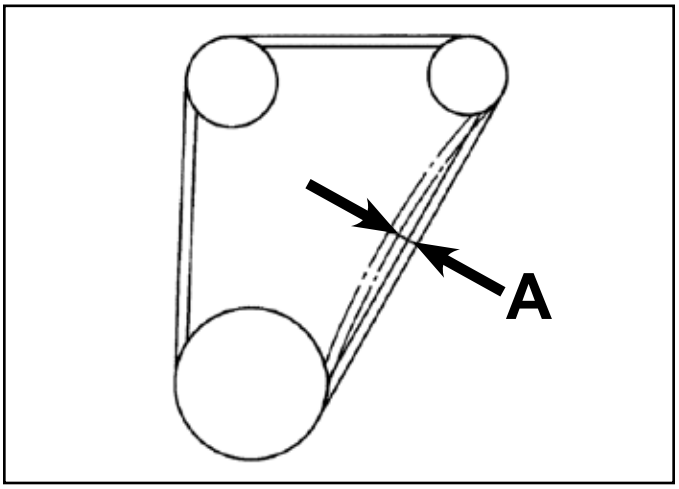

Fig 0071 fig. 3EEABAB1P017B

A. Deflection

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between the alternator and crankshaft pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is worn or damaged. Replace the pulley if the belt groove is worn excessively (Fig. 0072).

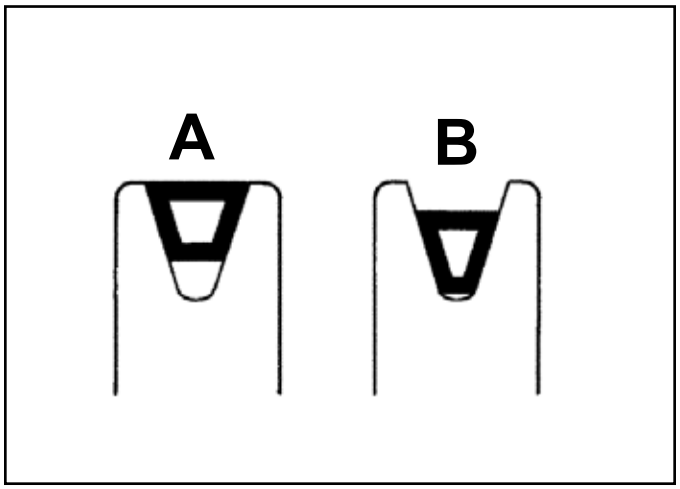

Fig 0072 fig. 3EEABAB1P018A

A. New belt B. Worn belt

Track Inspection

Clean the track and drive assembly daily.

Check the track surface daily for cracks and tears.

Replace the track if it is torn or cut and/or the tread is worn (Fig. 0073).

Track Tread (cracked/damaged/worn):

Fig 0073 PICT-3377

Check the center lugs daily for gouging and excessive wear (Fig. 0074).

Center Lug (damaged/worn):

Fig 0074 PICT-3378

Track Tension Adjustment 2-3/4” (7cm) (Fig. 0075).

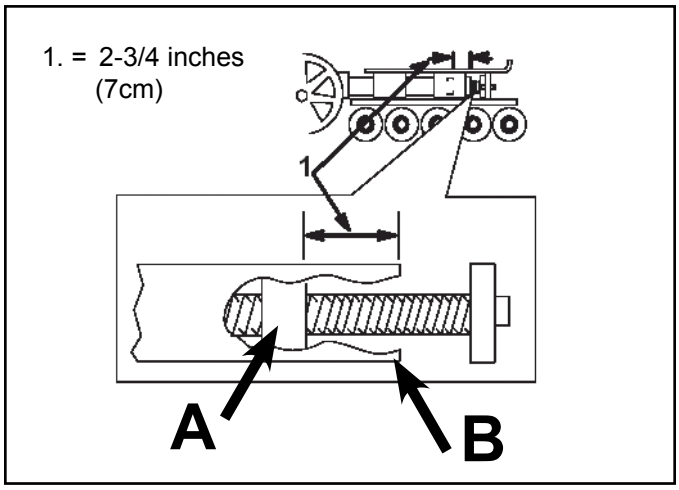

Fig 0075 track install #3

A. Tension nut B. Tensioner arm

Use an alignment tool (Toro p/n: 110-0069) to align the track guide to drive wheel prior to installing a new track, or if the track lugs display abnormal wear or gouging in use.

Replace the track if most of the center lugs are gouged or worn 1/2” (1.27cm) on either side or a combination of both sides. Nominal lug width is 2 1/2” (6.35cm) at the base of the lug.

Refer to “Track Guide Alignment” on page 7-3.

Refer to “Track Replacement”:
- “Wide Track Removal on page 7-68.
- “Narrow Track Removal” on page 7-72.

Battery Maintenance

Service Interval:

- Every 100 hours—Check the battery electrolyte level (batteries with inspection caps).
- Every 100 hours—Check the battery cable connections.

Battery Specification: 12 volt, 585 Cold Cranking Amps

Fig 0076 PICT-8762

Batteries are available in two basic versions; maintenance free and maintenance type.

With either type of battery it is important to have clean terminals and tight cable connections to the battery posts. Escaping gases from the battery causes corrosion at the terminals and other metal parts. The battery should be cleaned periodically using a baking soda and water mix; a couple of tablespoons baking soda to a pint (.5 liter) of water.

A maintenance type battery needs fluid level checks on a routine basis. Use distilled water to bring the battery cells to the correct level. Check and clean electrical connections and the charging system if the battery requires water frequently and corrosion becomes excessive; both are signs of over-charging.

A maintenance free battery is sealed and fluid can not be added.

Cold cranking amps (CCA) is a measurement of the number of amps a battery can deliver at 0° F (-17° C) for 30 seconds and not drop below 7.2 volts. So a high CCA battery rating is desireable, especially in cold weather. Sulfation of batteries starts when specific gravity falls below 1.225 or voltage measures less than 12.4 (12v Battery). Sulfation hardens the battery plates reducing and eventually destroying the ability of the battery to store a charge.

Sulfation is a normal process that slowly occurs over time and is the reason a battery eventually needs replacement. However, a battery that is allowed to become discharged and is left in this state will suffer permanent sulfation damage and require premature replacement. Occasional charging of the battery during storage is recommended to the keep the specific gravity to recommended levels. This will minimize the sulfation of the battery plates.

State of Charge	Specific Gravity	Voltage 12V
100%	1.265	12.7
75%	1.225	12.4
50%	1.190	12.2
25%	1.155	12.0
Discharged	1.120	11.9

Battery Testing

You must first have the battery fully charged prior to any test. The surface charge must be removed before testing. To remove surface charge the battery must experience a load of 20 amps for 3 plus minutes.

Battery specific gravity can be measured by using a hydrometer or a refractometer.

Load testing removes amps from a battery much like start-ing an engine would. The battery may have a label with the amp load for testing and/or a CCA Cold Cranking Amp rating. The load test number is 1/2 of the CCA rating. For example, a 500 CCA battery would load test at 250 amps for 15 seconds. A load test can only be performed if the battery is near or at full charge.

If you have a maintenance free battery, the only ways to test are with a digital voltmeter and/or a load test.

The reading on the digital voltmeter should be the voltage shown in the previous table. If you have voltage readings in the 10.5 volts range on a charged battery, that indicates a shorted cell.

Batteries used in equipment stored for some portion of the year can discharge and sulfation between the battery plates can occur and shorten the life of the battery.

Special Tools

Listed below are the special tools used in some of the procedures in this manual. To order these tools, contact the Toro Company.

Track Alignment Tool (Fig. 0077) - Toro P/N: 110-0069
For tool use example see page 7-3.

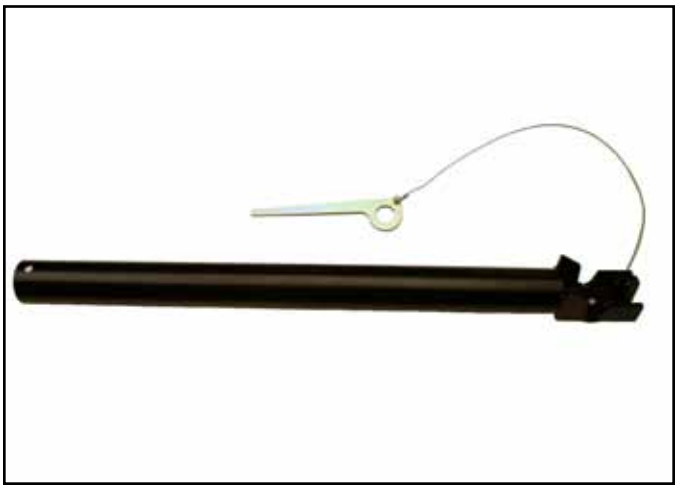

Fig 0077 PICT-4139a

Puller Kit (Fig. 0078) - Toro P/N: 112-2557
For tool use example see page 7-28, step 37.

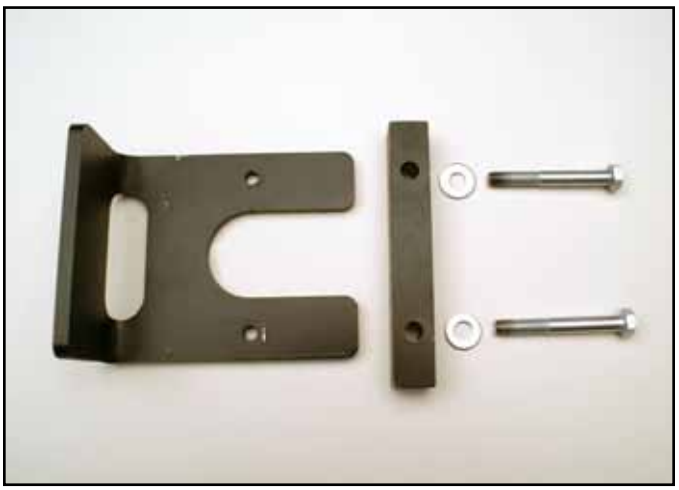

Fig 0078 PICT-4143b

Spring Removal Tool (Fig. 0079) - Toro P/N: 92-5771
For tool use example see page 7-6, step 10.

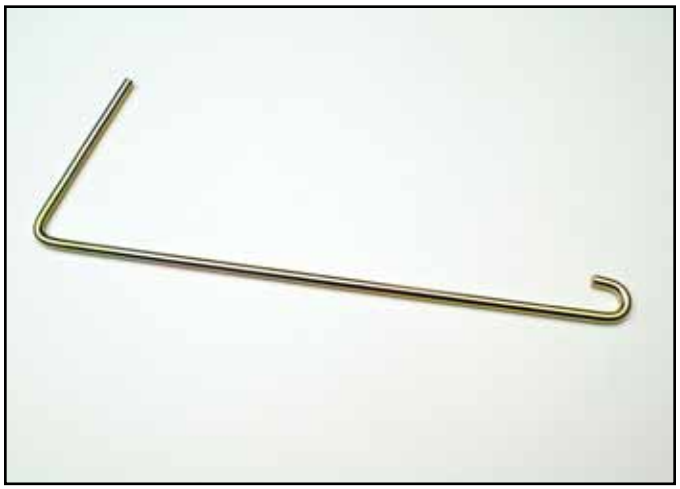

Fig 0079 PICT-4131b